PROC. BIOL. SOC. WASH.
90(4), 1977, pp. 798–807

BUCEROEMERSONIA, A NEW GENUS OF ISCHNOCERAN MALLOPHAGA FOUND ON THE HORNBILL GENUS *TOCKUS* (BUCEROTIDAE)

Robert E. Elbel

Abstract.—Elbel, Robert E., 1518 Evergreen, Salt Lake City, Utah 84106. —Descriptions and illustrations are presented for the new genus *Buceroemersonia* type *clarkei* and for two new species, *B. clarkei* and *B. brelihi*, found on the Hornbill genus *Tockus*. The distribution of three genera of Hornbill lice on *Tockus* is tabulated and discussed; it is suggested that *B. clarkei* may have evolved first from the stock that gave rise to the Hornbill Ischnocera.

Elbel (1976) described the new genus *Bucerocophorus* for three species that could not be included in either *Buceronirmus* or *Paroncophorus*. Another new genus, *Buceroemersonia*, is described here for two new species, *B. clarkei* and *B. brelihi*, which were first thought to belong to a species-group of *Buceronirmus* but characters of the preantennal region of the head and female terminal segments precluded this possibility. Dr. K. C. Emerson, Smithsonian Institution (USNM), concurred with this opinion. For the loan of specimens appreciation is expressed to: Dr. Theresa Clay, British Museum (Natural History) (BMNH), Dr. J. A. Ledger, South African Institute of Medical Research (SAIMR), and Dr. Savo Brelih, Yugoslavian Prirodoslovni Musej Slovenije (PMS). I obtained dried material from museum skins at the USNM, American Museum of Natural History (AMNH), and the Field Museum of Natural History (FMNH). Special thanks are extended to: Dr. L. T. Nielsen, Department of Biology, University of Utah, for providing space and facilities for this study and Drs. Mary LeCroy, AMNH, C. Moreby, BMNH, M. A. Traylor, FMNH, and G. E. Watson, USNM, for supplying host and locality information. Mallophagan terminology follows Clay (1958) except as noted and nomenclature of the hosts is that of Sanft (1960).

Buceroemersonia, new genus
Figs. 1, 4, 7

Marginal carina of forehead with a short rounded dorsomedial extension posteriorly, with a long dorsal seta each side at point of nearly complete interruption laterally (dorsal submarginal seta, Clay, 1951), and with 2 long dorsal setae posterior to marginal carina (anterior dorsal setae, Clay, 1951). Ventral carina complete. Antennae filiform, similar in both sexes. Pronotum with a long seta on each lateral margin. Pterothorax with posterior

marginal row of long setae and a short seta on each lateral margin. Metasternal plate triangular, expanded posteriorly, with 6–10, normally 8, setae. Abdominal segments with tergites, sternites, and pleurites, latter not prolonged posteriorly and with setae on margins of IV–X. Tergites II–V or II–VI, often X, in male and II–VII in female divided medially, remainder complete; on II–VIII both sexes with a posterior marginal row of setae, post-spiracular setae being most laterad on III–VII. Sternites II–VI in male and II or II–VI in female complete and on II–VII both sexes with a posterior marginal row of setae. Normal chaetotaxy of terminal segments illustrated for each species; male X with 1–2, normally 1, ventrolateral setae each side posterior to pleural stetae and sternites VII–XI fused into single genital plate with or without indentation between VII and VIII; female sternites VII–VIII may be fused into single genital plate and spermathecal sclerite may be present; vulval margin with a row of short setae and 4–6 minute setae; postvulval sclerite long, varying in shape for each species; and fused IX–XI with 2 dorsal and 5–6 sternal setae each side.

Buceroemersonia resembles most closely *Buceronirmus* in the dorsomedial extension of the marginal carina which is long in *Buceronirmus* but short and rounded in *Buceroemersonia*. The dorsal submarginal setae are absent and the anterior dorsal setae are short in *Buceronirmus* but these setae are long in *Buceroemersonia*. In the row of short setae on the female vulval margin, there are minute setae in *Buceroemersonia* but spines in *Buceronirmus*. On each lateral margin of fused IX–XI in the female, sternal setae each side are at least 8 arranged vertically in *Buceronirmus* but 5–6 arranged laterally in *Buceroemersonia*.

Species can most easily be separated by the shape of the ventral carina of the forehead, the number of ventral pleural setae on segments IV–VIII, the male genitalia, and the shape of the female vulval margin.

Etymology.—This genus is named for Dr. K. C. Emerson, USNM, in appreciation for his encouragement and many helpful suggestions on mallophagan taxonomy and on preparation of the Hornbill Mallophaga for publication.

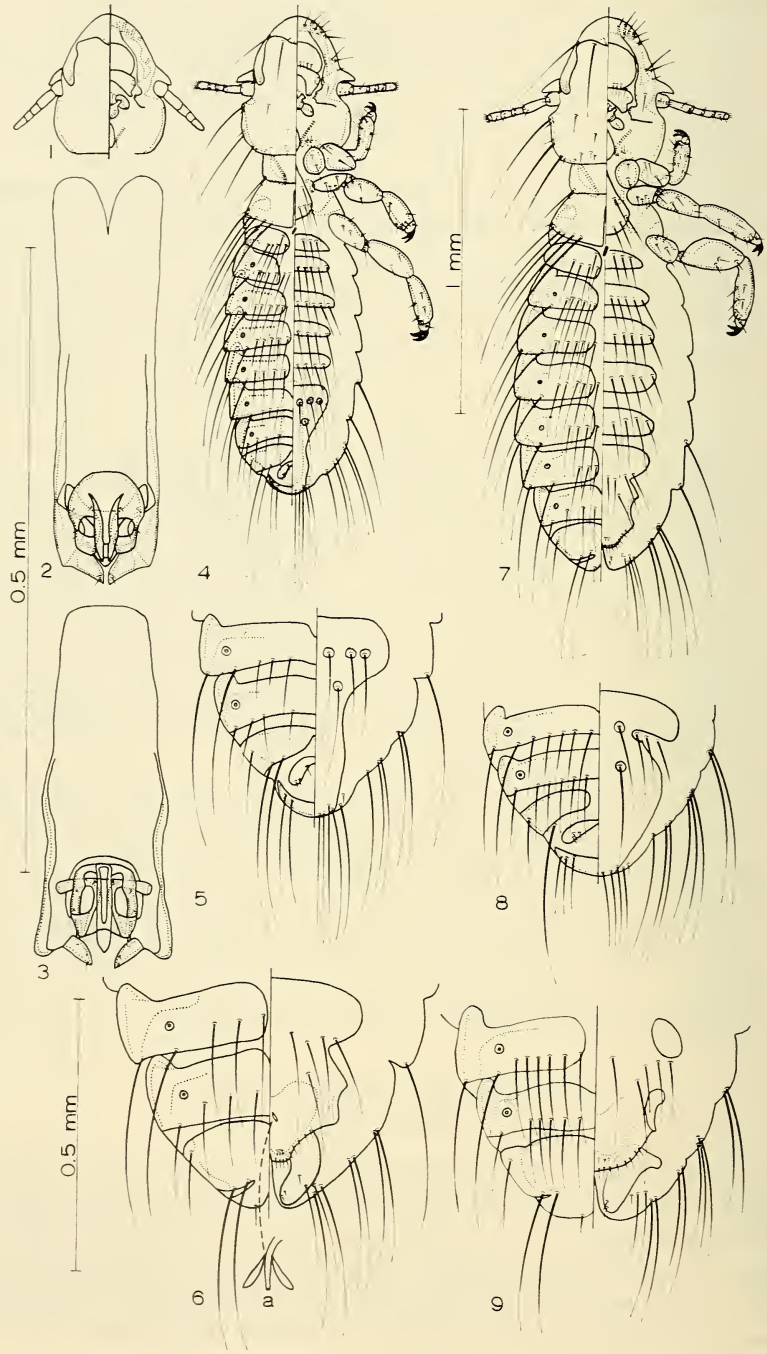
Type species.—*Buceroemersonia clarkei*, new species.

Buceroemersonia clarkei, new species
Figs. 2, 4–7

Type host.—*Tockus hemprichii* (Ehrenberg).

Both sexes are slightly larger than corresponding sexes of *B. brelihi*, n. sp., only in total length.

Male.—Normal chaetotaxy as in Fig. 4. Forehead with ventral carina evenly rounded anteriorly. Pterothorax with posterior marginal row of 10–12 long setae. Abdominal tergites II–VI divided medially; remainder con-


1
2
3
4
5
6
a
7
8
9
0.5 mm
0.5 mm
1 mm

plete. Tergocentral setae: range on II, VII–VIII 6–8; III 10–12; IV 10–14; V 8–12; VI 6–10. Pleural setae each side: dorsally on IV–VII and X 1; ventrally on V 0–1; VI–VII 1; VIII 2; X 2–4. Sternal setae: range on II 4–6; III–IV 6–12; V–VI 6–10; VII 6–8; VIII 2–4. Genitalia as in Fig. 2; penis with sclerites pointed and separated anteriorly; endomeres with paired lateral lobes expanded apically; parameres angled on each posterolateral margin. Terminal segments as in Fig. 5; tergite X nearly divided medially with 4 tergocentral setae; XI with 4–6 dorsal setae and ventral margin with 6–10 setae; genital plate without indentation between VII and VIII.

Female.—Sternites II–VI complete as for male. Normal chaetotaxy as in Fig. 7, differs from male as follows. Tergocentral setae: range on II 6–10; VIII 4–8. Sternal setae: range on II 4–8; IV 8–12; VII 6–10. Terminal segments as in Fig. 6; sternites VII–VIII fused into single genital plate; spermathecal sclerite long and slender, diverging posteriorly on each side of opening of spermathecal tube (Fig. 6a); vulval margin bluntly angled posteriorly with 16–22 short setae; postvulval sclerite each side long and inwardly curved.

Measurements in mm.—

	Width			Length	
	Head	Pterothorax	Abdomen	Head	Total
Male	0.36–0.39	0.34–0.38	0.46–0.57	0.46–0.50	1.59–1.76
Female	0.37–0.44	0.35–0.43	0.51–0.67	0.47–0.55	1.73–2.10

Type-material.—Holotype ♂, allotype ♀, *Tockus hemprichii*, USNM skin, Bodessa, Ethiopia, Africa, 20 May 1912, Childs Frick, in USNM; paratypes: 1♂ 3♀♀, with same data; 1♂ 4♀♀, USNM skins, Ethiopia, Africa, Feb.–May 1912, Childs Frick; 3♂♂ 2♀♀, FMNH skin, Mt. Albana, Ethiopia, Africa, 25 Nov. 1926, L. A. Fuertes; 1♂ 2♀♀, FMNH skin, Alghe, Ethiopia, Africa, 23 Sep. 1941, C. W. Benson.

Other specimens.—7♂♂ 20♀♀, *T. n. nasutus* (Linnaeus), Uganda, Africa, Apr. 1936, Meinertzhagen 7755, BMNH; 1♂ 1♀, Cameroon, Africa, 23 Jun. 1959, J. Mouchet, BMNH; 2♀♀, FMNH skins, Sudan, Africa, 1948–1950, H. Hoogstraal; 1♂ 2♀♀, *T. n. forskalii* (Ehrenberg), Aden, Saudi Arabia, Nov.–Dec. 1948, Meinertzhagen, BMNH; 5♂♂ 4♀♀, *T. n. epirhinus* (Sun-

←

Figs. 1–9. Dorsal–ventral views of head and body drawn to same scale: 1, *Bucero-emersonia brelihi*, male head; *B. clarkei*—4, Entire male; 7, Entire female. Male genitalia, ventral views drawn to same scale: 2, *B. clarkei*; 3, *B. brelihi*. Terminalia, dorsal–ventral views drawn to same scale: *B. clarkei*—5, Male; 6, Female, a, spermathecal sclerite on each side of opening of spermathecal tube; *B. brelihi*—8, Male; 9, Female.

devall), Zambia, Africa, 1953–1955, BMNH; 1♂ 3♀♀, Mabelikwa, Transvaal, South Africa, 18 Jan. 1957, F. Zumpt, BMNH; 2♀♀, USNM skins, Lake Upemba, Mabwe, Zaire, Africa, Dec. 1948, G. F. de Witte; 3♂♂ 6♀♀, *T. monteiri* Hartlaub, Windhoek, Namibia, Africa, 18 Jan. 1970, F. Zumpt, SAIMR; 3♂♂ 4♀♀, USNM skins, Waterberg, Namibia, Africa, May–Jun. 1936, W. Hoesch; 1♂ 2♀♀, *T. p. pallidirostris* (Finsch and Hartlaub), Cuango River, Cafunfo, Angola, 12 May 1971, S. A. Peles, SAIMR; 1♂, USNM skins, Mpata Hills, Zambia, Africa, Apr.–Jul. 1953, E. L. Haydock; 1♀, *T. p. neumanni* (Reichenow), FNMH skin, Morogoro, Tanzania, Africa, 19 May 1917, V. G. L. van Someren; 1♂ *T. pallidirostris* subsp., FMNH skins, Lundazi and Kafue River, Chilula, Zambia, Africa, 1945–1947, E. L. Button; 2♂♂ 1♀, *T. a. geloensis* (Neumann), Mpata Hills, Zambia, Africa, 1951, E. L. Haydock, BMNH; 6♂♂ 6♀♀, Muliashi, Zambia, Africa, 1952–1955, E. L. Haydock, BMNH; 4♂♂ 2♀♀, AMNH skins, Marungu Mts., Zaire, Africa, Mar. 1929, Rockefeller and Moses; 1♂ 2♀♀, AMNH skin, *T. a. suahelicus* (Neumann), Monkey Bay, Malawi, Africa, 19 Sep. 1895, P. Rendall; 1♀, USNM skins, Nairobi, Kenya, Africa, Aug.–Nov. 1909, Loring and Mearns; 2♂♂ 1♀, *T. alboterminatus australis* (Roberts), AMNH skins, Zululand, Natal, South Africa, Nov.–Dec. 1903, C. H. B. Grant; 1♂ 1♀, *T. bradfieldi* (Roberts), FMNH skins, Maun, Botswana, Africa, May–Jun. 1930, Vernay, Lang, and Roberts; 1♀, *T. griseus gingalensis* (Shaw), USNM skins, Embilipitiya, Ceylon, Jan.–Feb. 1944, S. D. Ripley; 1♂, USNM skin, Ceylon, B. H. Swales; 3♂♂ 6♀♀, *T. birostris* (Scopoli), Nepal, Mar. 1937, Meinertzhagen 9331, BMNH; 2♀♀, FMNH skins, Madras, India, Jan. 1937, W. Koelz; 1♂, FMNH skin, Londa, Mysore, India, 21 Jan. 1938, W. Koelz; 3♀♀, FMNH skins, Kalnahi, Uttar Pradesh, India, Feb. 1947, W. Koelz; 1♀, FMNH skin, RamanujGanj, Madhya Pradesh, India, 8 Nov. 1947, W. Koelz; 4♂♂ 1♀, FMNH skins, Simra, Nepal, 4 Mar. 1947, W. Koelz and R. Chand; 16♂♂ 14♀♀, FMNH skins, Kotla, Kangra, Punjab, India, 1946 and 1948, W. Koelz; 5♂♂ 8♀♀, FMNH skins, Baihar, Madhya Pradesh, India, Jan.–Feb. 1949, R. L. Flemming; 4♀♀, FMNH skins, Hardwar, Uttar Pradesh, India, Feb. 1951, R. L. Flemming; 2♀♀, USNM skins, India, 1898, 1946–1948.

Etymology.—This species is named for Dr. J. F. G. Clarke, USNM, in appreciation for financial help in collecting Oriental Mallophaga and in publishing Hornbill Amblycera (Elbel, 1967).

Buceroemersonia brelihi, new species
Figs. 1, 3, 8–9

Type host.—*Tockus deckeni* (Cabanis).

Both sexes are slightly smaller than corresponding sexes of *B. clarkei* only in total length.

Male.—Forehead with ventral carina pointed medially (Fig. 1). Ptero-

thorax with posterior marginal row of 12–16, normally 14, long setae. Abdominal tergites II–V, often VI, divided medially; remainder complete. Tergocentral setae: range on II and VIII 8–12, normally 10; III–V 12–16, normally 14; VI 10–14, normally 12; VII 10–12. Pleural setae each side: dorsally on IV–VII and X 1; ventrally on IV 0–1, normally 1; V 1–2, normally 1; VI–VII 2; VIII 3; X 2–3. Sternal setae: range on II, VI–VII 6–10, normally 8 on II and VII, 10 on VI; III 10–12, normally 10; IV–V 10–14, normally 12; VIII 2. Genitalia as in Fig. 3, penis rounded and closed anteriorly; endomeres with paired lateral lobes narrow; parameres with a rounded knob on each posterolateral margin. Normal chaetotaxy of terminal segments as in Fig. 8; tergite X divided medially with 2 tergocentral setae; XI with 6–8 dorsal setae and ventral margin with 4–6 setae.

Female.—Sternite II complete, III–VII circular or oval in shape. Chaetotaxy differs from male as follows. Tergocentral setae: range on II and VIII 10–12. Sternal setae: range on III 10–14, normally 12; VI 10–12. Normal chaetotaxy of terminal segments as in Fig. 9; sternite VII separate from VIII; spermathecal sclerite at most minute extensions on each side of spermathecal tube; vulval margin evenly rounded posteriorly with 12–18 short setae; postvulval sclerite each side long and outwardly curved with anterolateral projection.

Measurements in mm.—

	Width			Length	
	Head	Pterothorax	Abdomen	Head	Total
Male	0.36–0.41	0.32–0.37	0.47–0.58	0.42–0.48	1.33–1.53
Female	0.41–0.44	0.37–0.40	0.57–0.65	0.48–0.52	1.63–1.80

Type-material.—Holotype ♂, allotype ♀, *Tockus deckeni*, USNM skins, Tana River, Kenya, Africa, Aug. 1912, Childs Frick, in USNM; paratypes: 7♂♂ 12♀♀, with same data; 7♂♂ 7♀♀, USNM skins, Kenya, Africa, Jul.–Aug. 1912, Childs Frick; 1♂ 1♀, Koka, Ethiopia, Africa, 13 Dec. 1960, S. Brelih, PMS; 1♂ 1♀, USNM skins, Gato River, Gardula, Ethiopia, Africa, Apr.–May 1912, Childs Frick; 5♂♂ 2♀♀, USNM skins, Ethiopia, Africa, Jun. 1912, Childs Frick.

Other specimens.—1♂ 4♀♀, *T. nasutus forskalii* (Ehrenberg), Aden, Saudi Arabia, Nov. 1948, Meinertzhagen 17753, BMNH; 10♂♂ 7♀♀, *T. e. erythrorhynchus* (Temminck), Somalia, Africa, Jan.–Feb. 1949, Meinertzhagen, BMNH; 2♂♂ 2♀♀, Marsabit, Kenya, Africa, 21 Jan. 1956, Meinertzhagen 20512, BMNH; 7♂♂ 3♀♀, FMNH skins, Ethiopia, Africa, Dec. 1926, A. M. Bailey; 2♂♂ 3♀♀, USNM skins, Ethiopia and Kenya, Africa, Jun.–Jul. 1912, Childs Frick; 1♀, *T. e. rufirostris* (Sundevall), Gravelotte, Transvaal, South Africa, 28 Oct. 1957, F. Zumpt, BMNH; 3♂♂ 2♀♀, Goha Hill, Botswana, Africa, 21 Sep. 1958, F. Zumpt, BMNH; 1♂ 1♀, Chirundu,

Zambia, Africa, 17 Feb. 1964, F. Zumpt, BMNH; 3♀♀, Kariba, Rhodesia, Africa, 16 Feb. 1964, F. Zumpt, SAIMR; 3♂♂ 8♀♀, *T. f. flavirostris* (Ruppell), Hargeisa, Somalia, Africa, Jan.–Feb. 1949, Meinertzhagen, BMNH; 2♂♂ 1♀, Isiolo, Kenya, Africa, Feb. 1956, Meinertzhagen 20455, BMNH; 2♂♂, USNM skins, Ethiopia, Feb.–Jun. 1912, Childs Frick; 1♂, *T. f. leucomelas* (Lichtenstein), Limpopo River, Chicualacuala, Mozambique, Africa, 11 Jul. 1953, H. E. Paterson, BMNH; 3♂♂ 3♀♀, Debeeti, Botswana, 18 Jul. 1956, F. Zumpt, BMNH; 1♂, Newington, Transvaal, South Africa, 17 Jul. 1957, F. Zumpt, BMNH; 1♂, *T. alboterminatus geloensis* × *suahelicus*, AMNH skin, Meru Forest, Kenya, Africa, 10 Aug. 1912, Childs Frick; 2♂♂, USNM skins, with same data.

Etymology.—This species is named for Dr. Savo Brelih, PMS, in appreciation for the loan of this type-material as well as other Hornbill Amblycera and Ischnocera (Elbel, 1967 and 1976).

Discussion

Both species are similar in size, *Buceroemersonia clarkei* being slightly larger than corresponding sexes of *B. brelihi* only in total length. The ventral carina of the forehead is evenly rounded anteriorly in *B. clarkei* but pointed medially in *B. brelihi* (Figs. 1 and 4). The posterior marginal row on pterothorax has at most 12 long setae in *B. clarkei* but at least 12 in *B. brelihi*. There are normally more tergocentral setae on abdominal segments II–VIII of *B. brelihi* than corresponding sexes of *B. clarkei* but on X of males, *B. brelihi* has 2 tergocentral setae and *B. clarkei* has 4 (Figs. 5 and 8). Both species have a dorsal pleural seta on each side of IV–VII and X (Figs. 4, 7, 8–9). Ventrally on each side of IV–VIII *B. brelihi* normally has a pleural seta on IV–V, 2 on VI–VII, and 3 on VIII (Figs. 8–9) but *B. clarkei* has 1 on VI–VII and 2 on VIII (Figs. 5–6). Sternal setae on II and IV–VI are normally more numerous in *B. brelihi* than in corresponding sexes of *B. clarkei*. In the male genitalia penial sclerites are pointed and separated anteriorly only in *B. clarkei* which is also unique in having endomeres with the paired lateral lobes expanded apically and parameres that are angled on each posterolateral margin (Fig. 2). In *B. brelihi* the penis is rounded and closed anteriorly, the paired lateral lobes of endomeres are narrow, and the parameres have a rounded knob on each posterolateral margin (Fig. 3). The male tergite X is divided medially and the fused male genital plate is indented between VII and VIII only in *B. brelihi* (Fig. 8). There are more setae on tergite XI in males of *B. brelihi* than *B. clarkei* but the reverse is true for setae on the ventral margin (Figs. 5 and 8). Female sternites III–VII are circular or oval in shape for *B. brelihi* (Fig. 9) but II–VI are complete in *B. clarkei* (Fig. 7) and sternites VII–VIII are fused into a single genital plate only in *B. clarkei* (Figs. 6 and 9). Female spermathecal sclerite with long slender margins diverging posteriorly on each side of opening of spermathecal tube is present only in *B. clarkei* (Fig. 6a);

Table 1. Distribution of *Buceroemersonia*, *Bucerocophorus*, and *Chapinia* (Elbel, 1967, 1976) on the genus *Tockus* (Bucerotidae) arranged according to Sanft (1960).

Host	*Buceroemersonia*	*Bucerocophorus*	*Chapinia*
Tockus n. nasutus	*B. clarkei*		*C. lophocerus*
T. n. forskalii	*B. clarkei*		
	B. brelihi		
T. n. epirhinus	*B. clarkei*		*C. lophocerus*
T. n. dorsalis			
T. e. erythrorhynchus	*B. brelihi*		*C. lophocerus*
T. e. rufirostris	*B. brelihi*		*C. lophocerus*
T. e. damarensis			
T. deckeni	*B. brelihi*		*C. lophocerus*
T. f. flavirostris	*B. brelihi*		*C. lophocerus*
T. f. somaliensis			
T. f. elegans			
T. f. leucomelas	*B. brelihi*		*C. lophocerus*
T. hemprichii	*B. clarkei*		
T. monteiri	*B. clarkei*		
T. p. pallidirostris	*B. clarkei*	*B. latifrons*	
T. p. neumanni	*B. clarkei*		
T. c. camurus			*C. camuri*
T. c. pulchrirostris			
T. h. hartlaubi			
T. h. granti			*C. fasciati*
T. f. fasciatus		*B. latifrons*	*C. fasciati*
T. f. semifasciatus		*B. latifrons*	
T. a. alboterminatus		*B. latifrons*	
T. a. geloensis	*B. clarkei*	*B. latifrons*	*C. fasciati*
T. a. geloensis × *suahelicus*	*B. brelihi*		
T. a. suahelicus	*B. clarkei*	*B. latifrons*	*C. fasciati*
T. alboterminatus australis	*B. clarkei*	*B. latifrons*	*C. fasciati*
T. bradfieldi	*B. clarkei*		
T. g. griseus			*C. clayae*
T. griseus gingalensis	*B. clarkei*		
T. birostris	*B. clarkei*		*C. clayae*

posteriorly the female vulval margin is bluntly angled in *B. clarkei* but evenly rounded in *B. brelihi* and there are normally more setae on this margin in *B. clarkei* than in *B. brelihi*; the long postvulval sclerite each side is inwardly curved in *B. clarkei* but outwardly curved with an anterolateral projection in *B. brelihi* (Figs. 6 and 9).

Aviparasitological Relations

Species of the ischnoceran genus *Buceroemersonia* infest Hornbill hosts only in the genus *Tockus* and all species are infested except *T. camurus*.

T. hartlaubi, and *T. fasciatus* (Table 1). *B. clarkei* was found alone on *T. hemprichii*, *T. monteiri*, and *T. bradfieldi*, in association with *Bucerocophorus latifrons* on *T. pallidirostris*, and with *Chapinia clayae* on *T. griseus* and *T. birostris*. The only ischnoceran species found on *T. erythrorhynchus*, *T. deckeni*, and *T. flavirostris* was *Buceroemersonia brelihi* but a few *B. brelihi* were found on *T. nasutus* and *T. alboterminatus*, host species infested by *B. clarkei*. In fact on *T. n. forskalii* both *B. clarkei* and *B. brelihi* infested the same host specimen. *C. lophocerus* shared common hosts with these ischnoceran lice except on *T. alboterminatus* where *C. fasciati* and *Bucerocophorus latifrons* were found.

Tockus is the only Hornbill genus with members in both the Ethiopian and Oriental Regions (Sanft, 1960). As noted by Elbel (1967), the amblyceran, *C. clayae*, found on the Oriental species, *T. griseus* and *T. birostris*, resembled most closely *C. acutovulvata*, found on Oriental species of *Anthracoceros*, rather than *Chapinia* that infested Ethiopian species of *Tockus*. Kellogg (1896) stated that Mallophaga spent their entire lives on the host bird and new hosts were infested by migration of lice from one bird to another during copulation, nesting, or roosting. According to Clay (1949), birds of different species normally did not come in close enough contact to transfer lice. However, Clay (1962) described natural straggling as occurring between hosts that happened to be nesting in close proximity and establishment on the new host might be facilitated by the absence of a resident louse. Elbel (1967) suggested that there may have been more recent contact between the Indian *Tockus* and *Anthracoceros* whose ranges overlapped than between the more nearly related Indian and African *Tockus*; natural straggling may have accounted for establishment of *Chapinia* on *Anthracoceros*. This view is not supported by the ischnoceran *Buceroemersonia clarkei* which was found on *Tockus* in both regions, but speciation rates in the Amblycera and Ischnocera have been so different that comparisons on the same host group have little value (Clay, 1957). According to Kellogg (1896) the ancestral bird species spread and gave rise to geographical races which eventually became distinct species, often distinguished only by superficial differences in color, etc., but the Mallophaga remaind nearly the same because their environment was essentially the same. The environment of the Mallophaga, the physical and chemical composition of the feathers and blood, presumably changes slower than do other factors leading toward speciation of the bird (Clay, 1949). For example, *B. clarkei* infests 13 hosts in 8 species in both the Ethiopian and Oriental regions but *B. brelihi* infests 7 hosts in 5 species in the Ethiopian region. Female sternites II–VI are complete in *B. clarkei* (Fig. 7) as for males of *Buceroemersonia*, *Bucerocophorus* and *Buceronirmus*, but III–VII are circular or oval in shape for *B. brelihi* (Fig. 9) as for females of *Bucerocophorus* (Elbel, 1976) and *Buceronirmus* (Elbel, 1977). With its wider

distribution and uniqueness of the female abdominal sternites, *B. clarkei* may have evolved first from the stock that gave rise to the Hornbill Ischnocera. Similarly, Elbel (1967) thought that both Ethiopian and Oriental species of *Chapinia* shared a common ancestor of *Chapinia* on *Tockus* before the Indian and African *Tockus* became separated, but once separated the *Chapinia* evolved as did the Hornbills to the recognized species within each region.

Literature Cited

Chapin, J. P. 1954. Gazetteer for "The birds of the Belgian Congo." Bull. Amer. Mus. Nat. Hist. 75B:638–738.

Clay, T. 1949. Some problems in the evolution of a group of ectoparasites. Evolution 3:279–299.

———. 1951. An introduction to a classification of the avian Ischnocera (Mallophaga): Part I. Trans. R. Ent. Soc. London 102:171–194.

———. 1957. The Mallophaga of birds. Pages 120–158 *in* First symposium on host specificity among parasites of vertebrates. I.U.B.S. and Univ. Neuchatel, Neuchatel.

———. 1958. Revisions of Mallophaga genera. *Degeeriella* from the Falconiformes. Bull. British Mus. (Nat. Hist.) Ent. 7:121–207.

———. 1962. A key to the species of *Actornithophilus* Ferris with notes and descriptions of new species. Bull. British Mus. (Nat. Hist.) Ent. 11:191–252.

Elbel, R. E. 1967. Amblyceran Mallophaga (biting lice) found on the Bucerotidae (Hornbills). Proc. U.S. Natl. Mus. 120:1–76.

———. 1976. *Bucerocophorus*, a new genus of ischnoceran Mallophaga from African Hornbills (Bucerotidae). Proc. Biol. Soc. Washington 89:313–324.

———. 1977. Two new *Buceronirmus* (Mallophaga: Philopteridae) from *Rhyticeros undulatus* and *R. plicatus* (Hornbills). Pacific Ins. 17:413–418.

Friedmann, H. 1930. Birds collected by the Childs Frick expedition to Ethiopia and Kenya colony. Part I. Non-Passeres. U.S. Natl. Mus. Bull. 153:xiii + 516 pp.

Kellogg, V. L. 1896. New Mallophaga I: With special reference to a collection made from maritime birds of the bay of Monterey, California. Proc. California Acad. Sci. 6:31–182.

Sanft, K. 1960. Bucerotidae (Aves: Upupae). Das Tierreich 76:1–176.